

REMARKS

This response is intended as a full and complete response to the non-final Office Action mailed January 10, 2005. In the Office Action, the Examiner notes that claims 1-28 are pending and rejected. By this response, all claims continue unamended by this response.

In view of the following discussion, the Applicant submits that none of the claims now pending in the application are anticipated or obvious under the respective provisions of 35 U.S.C. §102 and 103. Further, the Applicant has submitted sheet 2 of the formal drawings which sheet was indicated by the Examiner to be missing from the drawings received on February 12, 2002.

Objections

Drawings

The Examiner indicates that the drawings received on February 12, 2002 are missing sheet 2 of 4. Sheet 2 of 4 is resubmitted herewith.

Rejections

35 U.S.C. §102

Claims 1-3, 7-12, 14-20 and 22

The Examiner has rejected claims 1-3, 7-12, 14-20 and 22 under 35 U.S.C. §102(b) as being anticipated by Garmonov et al. (US Patent 6,510,173, hereinafter "Garmonov"). The Applicant respectfully traverses the rejection.

"Anticipation requires the presence in a single prior art reference disclosure of each and every element of the claimed invention, arranged as in the claim" (Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co., 730 F.2d 1452, 221 USPQ 481, 485 (Fed. Cir. 1984) (citing Connell v. Sears, Roebuck & Co., 722 F.2d 1542, 220 USPQ 193 (Fed. Cir. 1983)) (emphasis added). The Garmonov reference fails to disclose each and every element of the claimed invention, as arranged in the claims.

The Examiner alleges that regarding claim 1, Garmonov discloses coding at least two pairs of symbol sub-streams to form, a respective pair of transmit-sequence chain where the space-time coding is such that at least one of the formed pairs is a function of the respective pair and not a function of other pairs. The Applicant respectfully disagrees.

The Applicant's independent claim 1 recites:

"A method for use in a system adapted to transmit at least four series of transmit sequences over at least four transmit antennas, the method comprising the step of:

space-time coding at least two pairs of symbol sub-streams, each of the pairs of symbol streams being space-time coded to form a respective pair of the transmit-sequence chains, the space-time coding being such that at least one of the formed pairs of the transmit-sequence chains is a function of symbols of the respective pair of symbol sub-streams and not a function of the symbols of the other pairs of the symbol sub-streams."

In support of the Applicant's invention with respect to at least claim 1, the Applicant, in the specification specifically recites:

"The channel coded and mapped symbol stream 125 is divided into a plurality of symbol sub-streams 137-1, 137-2, 137-3, and 137-4 typically by demultiplexing symbol stream 125 in demultiplexer 130 into the plurality of symbol sub-streams." (See Specification, page 6, lines 10-13).

The Applicant in the specification further discloses:

"The symbol sub-streams 137-1, 137-2, 137-3, and 137-4 are supplied to space-time encoder 140 where every symbol period, space-time encoder 140 processes the symbols of the symbol sub-streams to form a part of each of four transmit-sequence chains 142-1, 142-2, 142-3, and 142-4. The transmit-sequence chains are composed of transmit sequences. Each transmit sequence spanning at least four symbol periods. The symbols are processed to develop their complex conjugate. Each transmit sequence of a particular transmit-sequence chain is formed from 1) a symbol of one of the symbol sub-streams of the respective symbol-sub-stream pair and 2) a complex conjugate of a symbol of the other symbol sub-stream of the respective symbol-sub-stream pair." (See Specification, page 6, lines 15-26).

It is clear from at least the portion of the Applicant's Specification depicted above that the invention of the Applicant is directed, at least in part, to a method for use in a system adapted to transmit at least four series of transmit sequences

over at least four transmit antennas by dividing the symbol stream into at least four symbol sub-streams. (See Fig. 2). Symbols from a symbol stream are divided into a plurality of symbol sub-streams. The sub-streams are paired off. Using the symbols of the pairs of sub-streams, transmit-sequence chains are composed. These transmit-sequence chains are modulated and spread for transmission over the antennas.

The Applicant respectfully submits that, in contrast to Applicant's invention, there is absolutely no teaching, suggestion or disclosure in Garmonov for space-time coding at least two pairs of symbol sub-streams, each to form a respective pair of transmit sequence chains where the space-time coding is such that at least one of the formed pairs is a function of the respective pair and not a function of other pairs.

Garmonov specifically discloses in figure 4 and the corresponding description from column 9, line 28 to column 11, line 18 a sequence of operation of the transmitting side. Garmonov discloses transforming symbols of the incoming serial symbol packet into parallel information packets of those symbols. The parallel groups are reordered and each one of those symbol is combined with its respective orthogonal code. Each of those information packets is spread and transmitted over four space diversity channels. There is absolutely no disclosure, suggestions or teachings in Garmonov for space-time coding at least two pairs of symbol sub-streams, each to form a respective pair of transmit-sequence chains where the formed pairs are a function of a respective pair and not a function of the other pairs. More specifically, Garmonov does not disclose the coding of at least two pairs of symbols; the pair forming transmit-sequence chain; and where the transmit-sequence chain is a function of the symbol pair and is not a function of the other symbols.

In the present invention, at least two pairs of symbol sub-stream are coded. For example, the symbol sub-streams formed are paired so that B_1 and B_2 are paired (See Specification, page 7, lines 7-8). Garmonov does not pair the sub-streams. Garmonov does not disclose, teach or suggest the use of symbol pairs. Garmonov combines a binary symbol with its orthogonal code. The

orthogonal codes disclosed by Garmonov are not symbols of the sub-streams; therefore, they should not be interpreted as being part of symbol sub-stream pair. Thus, applying binary symbol to the orthogonal code does not anticipate the sub-stream symbol pairs as claimed.

In addition, the present invention includes a transmit-sequence chain that is not taught or shown in Garmonov. Each symbol sub-stream pair forms a transmit-sequence chain. For example, the chain is a function that incorporates a symbol from a sub-stream and a complex conjugate of the other symbol from the symbol sub-stream from the pair. Garmonov does not disclose, teach or suggest a transmit-sequence chain as claimed. More specifically, Garmonov does not disclose, teach or suggest the inclusion of complex conjugate of the symbol in forming the packets for transmission. As shown in Fig. 4 (e) of Garmonov, only binary symbols are included. There is no hint at the use of complex conjugate of any of the symbols. Thus, Garmonov does not disclose, teach or suggest a transmit-sequence chain of the present invention.

Also, claim 1 requires the transmit-sequence chain to be a function of the respective pair and not the symbols of the other sub-stream symbols. For example, if B_1 and B_2 are paired, then the transmit-sequence chain function will not contain B_3 and B_4 . Garmonov does not disclose, teach or suggest not using certain symbols. As shown in Figure 4, (e), (g), and (h) of Garmonov, all four symbols are included in the transmission for each channel. Thus, the transmit-sequence chain as a function of the respective symbol pair and not a function of the symbols of the other symbol sub-streams is not disclosed, taught or suggested by Garmonov.

In sum, Garmonov does not disclose, teach or suggest the use of symbol pairs; the inclusion of complex conjugate of the symbol; and exclusion of symbols when forming the chain for spreading the symbols for transmission. Because not all the elements are disclosed in Garmonov, withdraw of the rejection for claim 1 is respectfully solicited.

The Examiner further asserts that regarding claim 10, Garmonov discloses an apparatus utilizing the method of claim 1. The applicant respectfully

disagrees because Garmonov did not disclose the method of “space-time coding at least two pairs of symbol sub-streams, each of the pairs of symbol streams being space-time coded to form a respective pair of the transmit-sequence chains, the space-time coding being such that at least one of the formed pairs of the transmit-sequence chains is a function of symbols of the respective pair of symbol sub-streams and not a function of the symbols of the other pairs of the symbol sub-streams.” Therefore, Garmonov could not disclose an apparatus using the method of claim 1.

Applicant respectfully submits that Garmonov fails to teach, disclose or suggest at least the Applicant’s claim 10, which specifically includes the limitation of “a space-time encoder adapted to space-time code at least two pairs of symbol sub-streams, each of the pairs of symbol streams being space-time coded to form a respective pair of the transmit-sequence chains, the space-time coding being such that at least one of the formed pairs of the transmit-sequence chains is a function of symbols of the respective pair of symbol sub-streams and not a function of the symbols of the other pairs of the symbol sub-streams.” As presented above with respect to claim 1, Garmonov is silent with regards to the coding of pairs of symbols and forming transmit-sequence chain where it is not a function of the other pairs. Because Garmonov did not utilize the method of claim 1, its apparatus does not disclose the transmitter of claim 10. Therefore, withdraw of the rejection for claim 10 is respectfully requested.

The Examiner further asserts that regarding claim 20, Garmonov discloses a receiver with at least one antenna and a matrix multiplier of 5A which the examiner interpreted as providing equivalent functionality. Applicant respectfully disagrees because Garmonov did not disclose all the limitations of claim 20.

Applicant respectfully submits that Garmonov fails to teach, disclose or suggest at least the Applicant’s claim 20, which specifically includes the limitation of “a matrix multiplier for multiplying a matrix with received symbol sub-streams of a signal received by the receive antenna, the matrix having at least two pairs of consecutive rows, each such pair being a function of channel characteristics of at least two channels that terminate on the receive antenna but not of channel

characteristics of other channels that terminate on the receive antenna, and the matrix being orthogonal."

Garmonov discloses:

on the receiving side: a sequence of correlation vectors is split into serial packets of N correlation vectors, each correlation vector is multiplied by the complex conjugate of received pilot signal vectors, and real part of each product is collected, thus forming serial-parallel packet of correlation coefficients, reordering, inverse to the reordering of serial-parallel information packet binary symbols on the transmitting side, is performed in the parallel groups of serial-parallel correlation coefficient packet, a serial-parallel packet of binary orthogonal code symbols, corresponding to the serial-parallel packet of orthogonal code symbols on the transmitting side and containing N serial and N parallel groups of binary orthogonal code symbols, is generated, correlation of the serial groups of serial-parallel correlation coefficient packet to the serial groups of serial-parallel orthogonal code symbol packet is calculated forming a parallel packet of N soft decisions corresponding to N binary symbols of parallel information packet on the transmitting side, parallel-to-serial transformation of parallel packet of soft decisions is carried out producing an output soft decision stream.

This description and figure 5A show a sequence of operation on the receiving side. It makes no mention or teaching of multiplying a matrix with received symbol sub-streams wherein the matrix having at least two pairs of consecutive rows, each such pair being a function of channel characteristics of at least two channels that terminate on the received antenna but not of channel characteristics of other channels that terminated on the receive antenna. Because Garmonov's apparatus does not perform the same function as the present invention, Garmonov's receiver is not functionally equivalent to the claim 20. Therefore, the 35 U.S.C. §102 rejection is improper and should be withdrawn.

From at least the discussion presented above, it is clear the Garmonov fails to teach, suggest or disclose each and every element of the Applicant's claimed invention.

As such, the Applicant submits that independent claims 1, 10 and 20 are not anticipated and fully satisfy the requirements of 35 U.S.C. §102 and are patentable thereunder. Furthermore, claims 2-3, 7-9, 11-12, 14-19 and 22

depend, either directly or indirectly, from independent claims 1, 10 and 20 and recite additional features thereof. As such and at least for the same reasons as discussed above, the Applicant submits that these dependent claims are also not anticipated and fully satisfy the requirements of 35 U.S.C. §102 and are patentable thereunder. Therefore, the Applicant respectfully requests that the Examiner's rejection be withdrawn.

35 U.S.C. §103

Claims 4-6, 13 and 21

The Examiner has rejected claims 4-6, 13 and 21 under 35 U.S.C. §103(a) as being unpatentable over Garmonov. Applicant respectfully traverses the rejection.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.

The Examiner asserts for claims 4-6, 13 and 21 that there are alternative forms to matrix order and symbol order implied in Garmonov; therefore, it would have been obvious for one of ordinary skill of the art at the time of the invention to utilize an alternative scheme. The Applicant respectfully disagrees.

First, there is no motivation or suggestion in Garmonov to use symbol pairs and their conjugates with the system of Garmonov as suggested by the Examiner. Garmonov does not even hint that the matrix could be formed in the composition described by the claims. Second, if the transmitter-receiver of Garmonov were to use the matrix of claims 4-6, 13 and 21, that apparatus would not function because the transmission scheme of Garmonov is completely different from the present invention. Finally, forming a matrix with symbol pairs and their conjugates are not taught or suggested by Garmonov. Garmonov

merely discloses that binary symbols could be reordered, but it does not even hint at using symbol pairs and its conjugates. Thus, the Applicant submits that the basis for the Examiner's obviousness rejection of claims 4-6, 13 and 21 relying on Garmonov is improper. As such, the Applicant submits that claims 4-6, 13 and 21 are not obvious and fully satisfy the requirements of 35 U.S.C. §103 and are patentable thereunder.

SECONDARY REFERENCES

The secondary references made of record are noted. However, it is believed that the secondary references are no more pertinent to the Applicant's disclosure than the primary references cited in the Office Action. Therefore, the Applicant believes that a detailed discussion of the secondary references is not necessary for a full and complete response to this Office Action.

CONCLUSION

Thus, the Applicant submits that none of the claims presently in the application are anticipated or obvious under the respective provisions of 35 U.S.C. §102 and §103. Accordingly, both reconsideration of this application and its swift passage to issue are earnestly solicited.

If, however, the Examiner believes that there are any unresolved issues requiring adverse final action in any of the claims now pending in the

application, it is requested that the Examiner telephone Eamon J. Wall at (732) 530-9404 so that appropriate arrangements can be made for resolving such issues as expeditiously as possible.

Respectfully submitted,

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Page 8 of 17

IN THE DRAWINGS

Sheet 2 of the formal drawings is enclosed.